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Thermodynamics of an interacting fermi system in the static fluctuation approximation 1

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Abstract

We suggest a new method of calculation of the equilibrium correlation functions of an arbitrary order for the interacting Fermi-gas model in the framework of the static fluctuation approximation method. This method based only on a single and controllable approximation allows obtaining the so-called far-distance equations. These equations connecting the quantum states of a Fermi particle with variables of the local field operator contain all necessary information related to the calculation of the desired correlation functions and basic thermodynamic parameters of the many-body system. The basic expressions for the mean energy and heat capacity for the electron gas at low temperatures in the high-density limit were obtained. All expressions are given in the units of r s, where r s determines the ratio of a mean distance between electrons to the Bohr radius a 0. In these expressions, we calculate terms of the respective order r s and r 2 s It is also shown that the static fluctuation approximation allows finding the terms related to higher orders of the decomposition with respect to the parameter r s. © Pleiades Publishing, Inc., 2012.

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